Industry Day Briefing
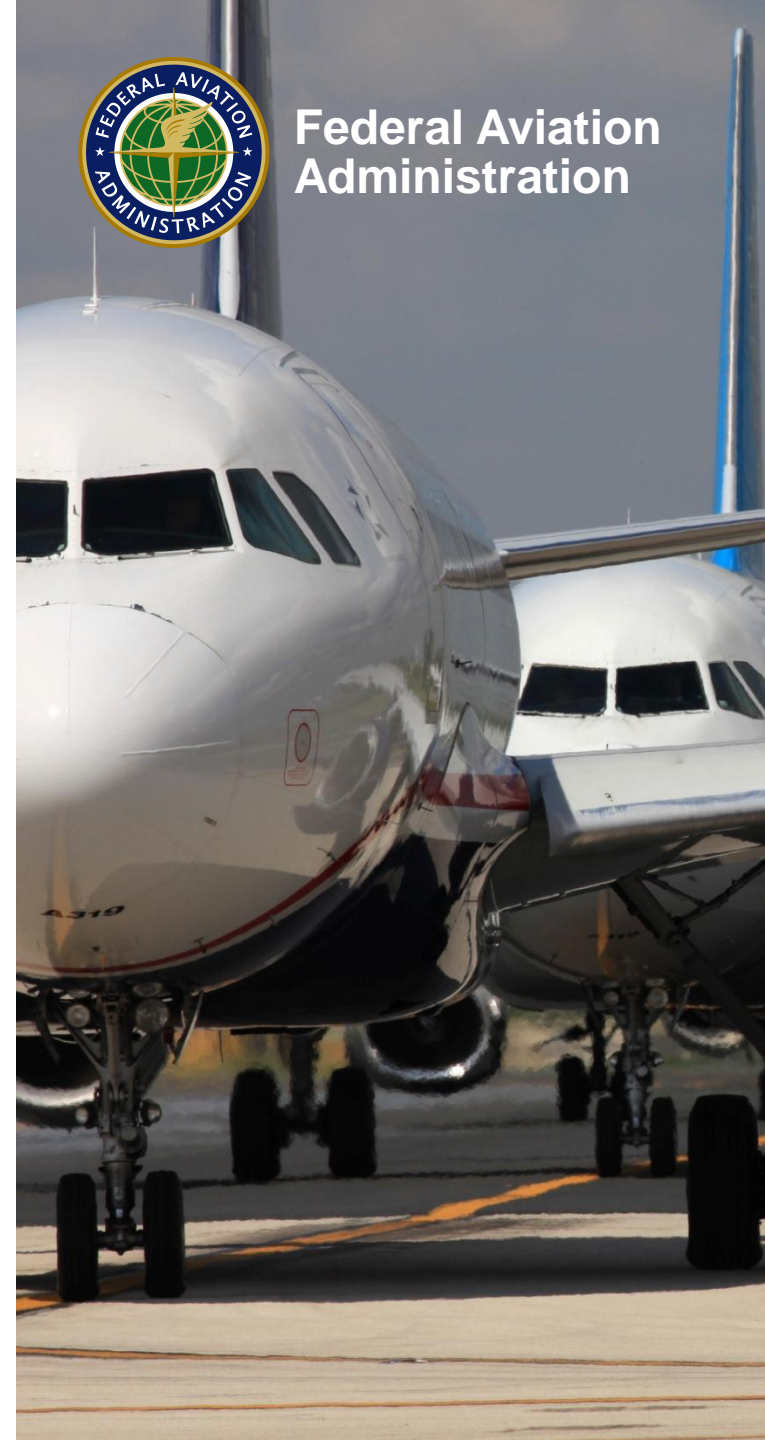
Time Based Flow Management (TBFM)

Bob Tyo, TBFM Program Manager
Chris Pressler, TBFM Systems Engineer
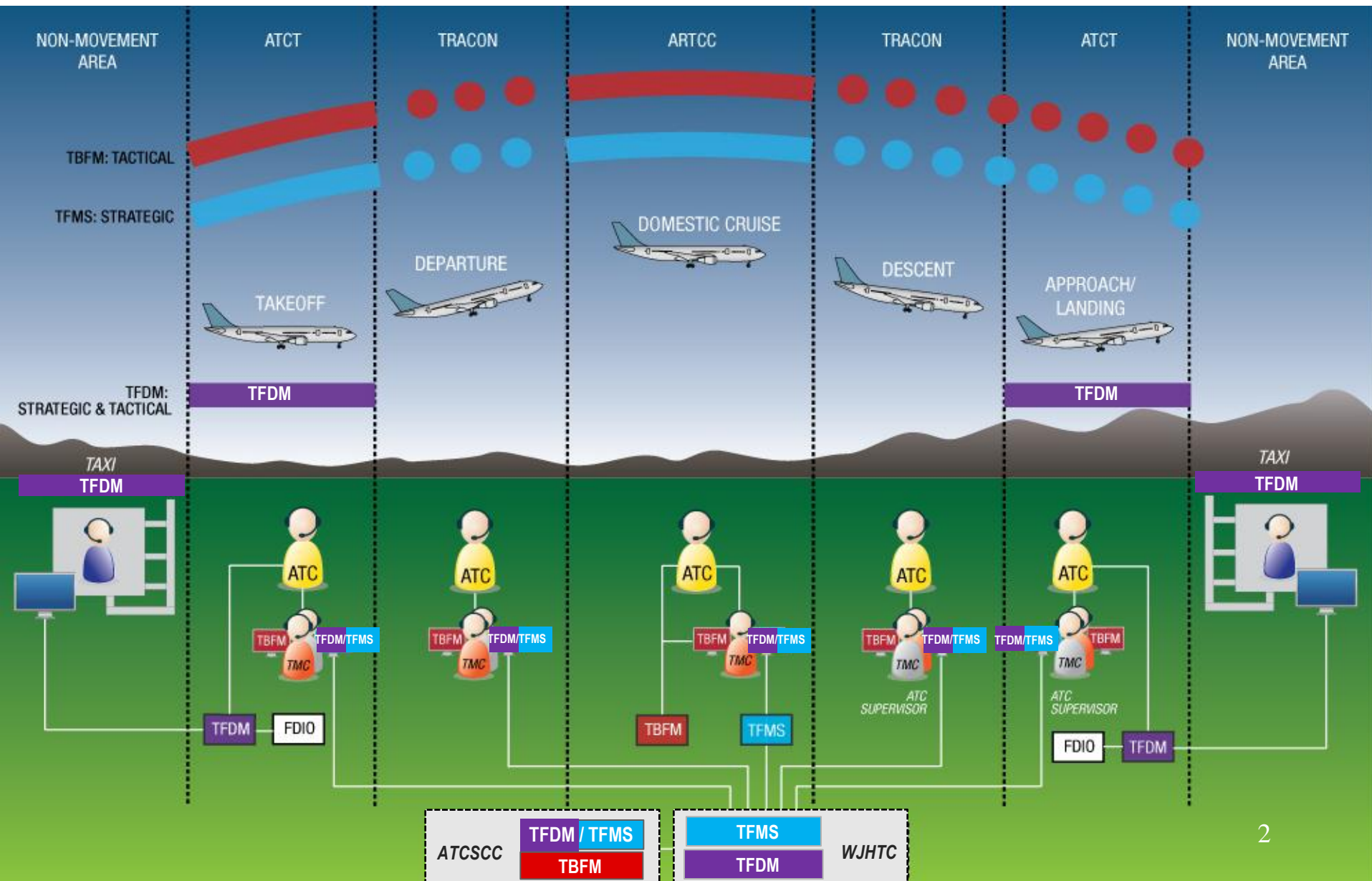
April 23, 2014

Federal Aviation Administration

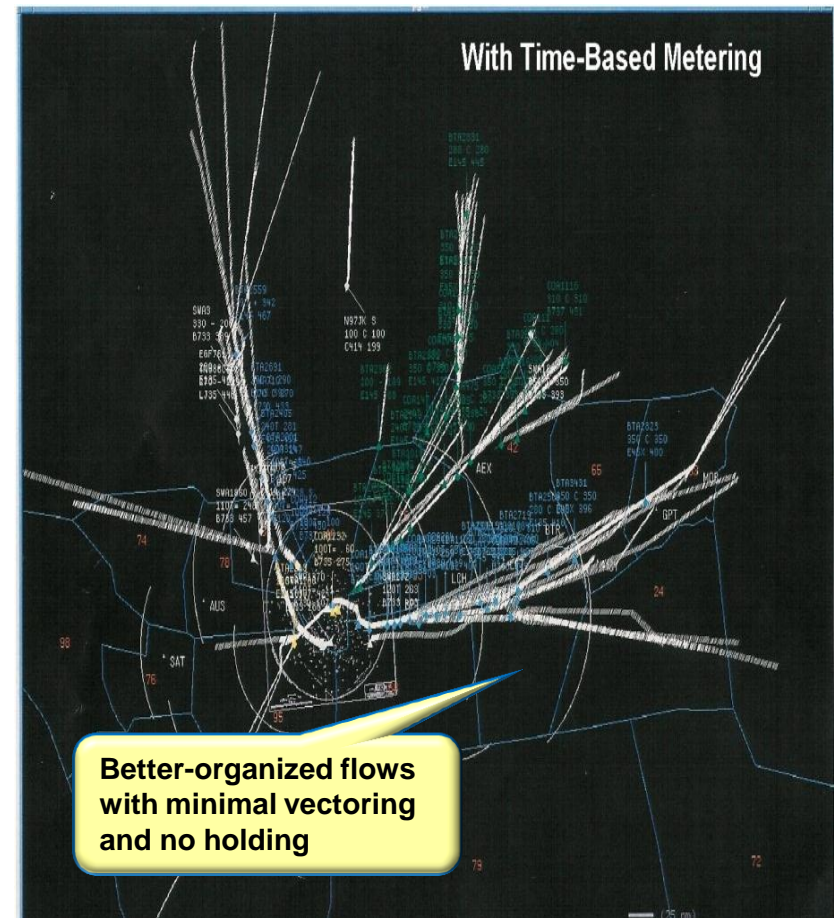# Integrated TBFM: *3Ts working together*
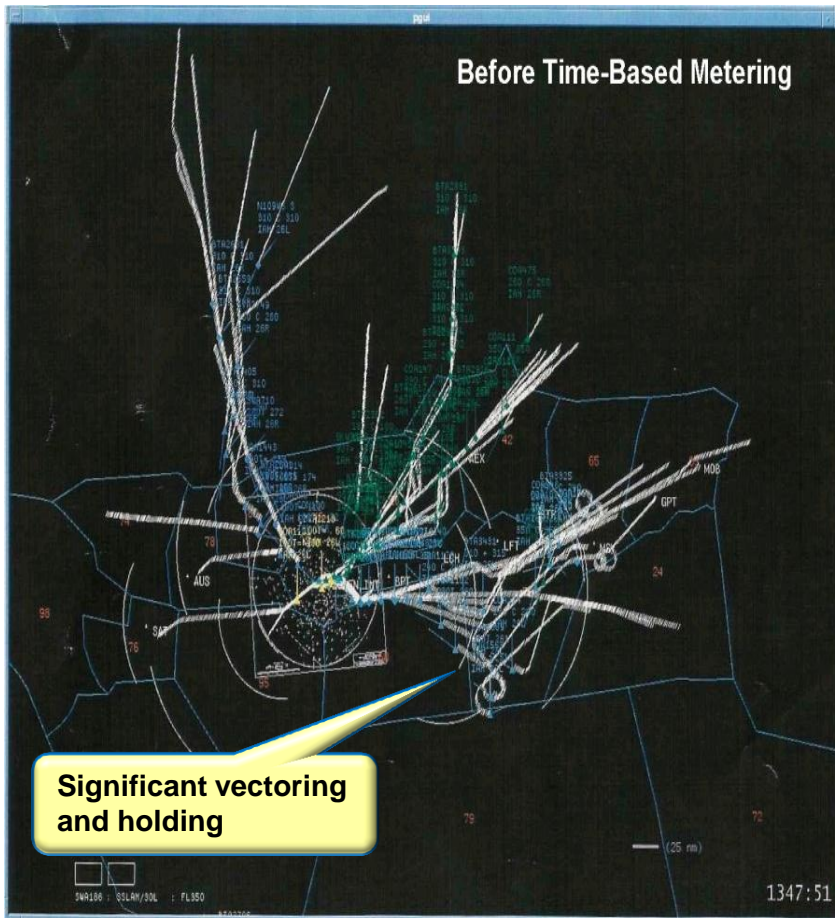
Agenda

- **TBFM Background**
  - History
  - Program Status
- **Major Enhancements under Work Package 2**
  - Information Sharing
  - GIM (Extended Metering and Speed Advisory)
  - Integrated Departure and Arrival Control (IDAC)
  - RNAV
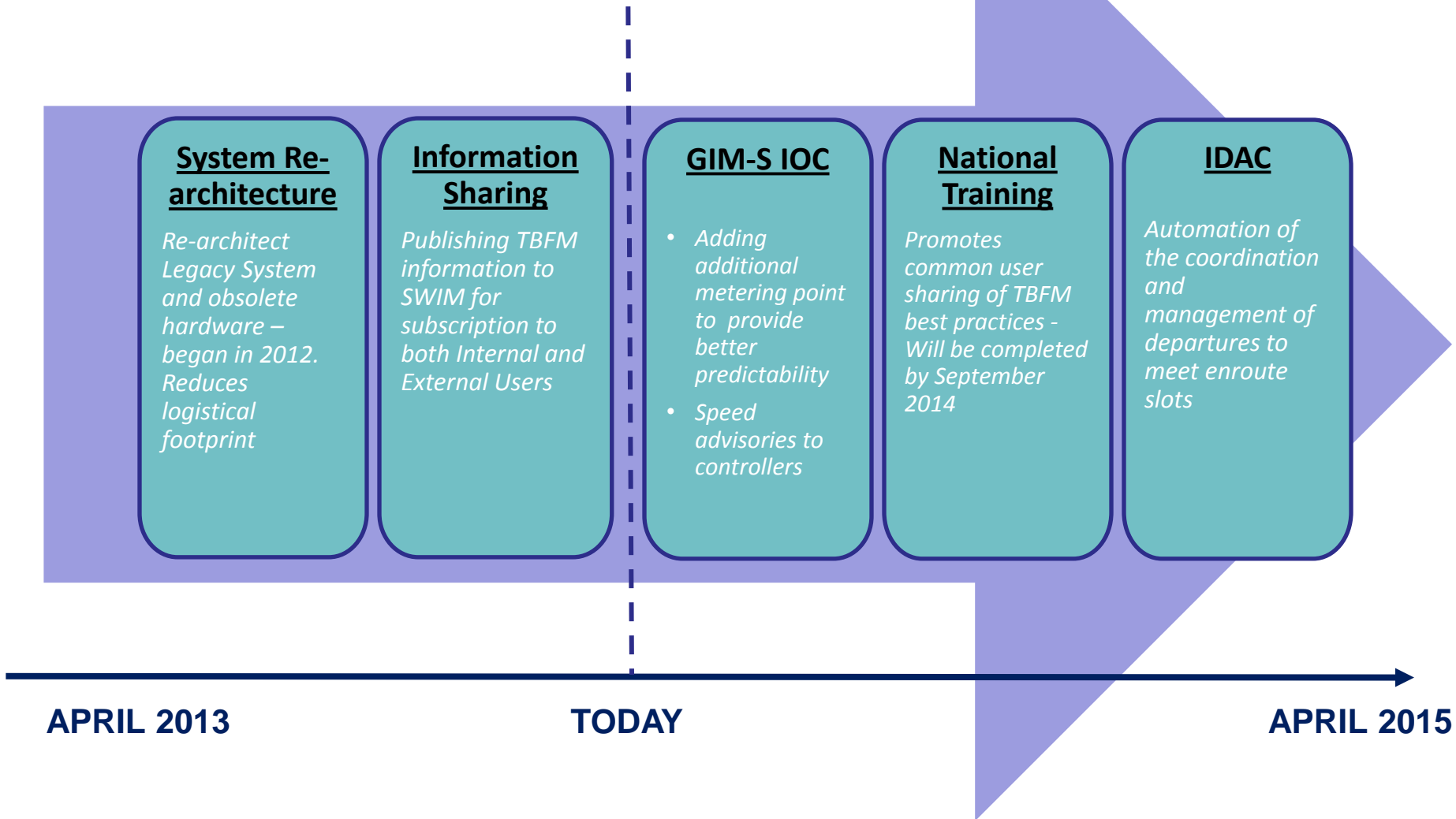- **Future Direction under Work Package 3**
- **Q&A**

Background: Time Based Metering

Graphics show actual traffic flows at ZHU during same rush period on consecutive days <u>with</u> and <u>without</u> TBFM Metering:

Before Time-Based Metering

Significant vectoring and holding

With Time-Based Metering

Better-organized flows with minimal vectoring and no holding

TBFM Program Status - Implementation

System Re-architecture

Re-architect Legacy System and obsolete hardware – began in 2012. Reduces logistical footprint

Information Sharing

Publishing TBFM information to SWIM for subscription to both Internal and External Users

GIM-S IOC

- *Adding additional metering point to provide better predictability*
- *Speed advisories to controllers*

National Training

Promotes common user sharing of TBFM best practices - Will be completed by September 2014

IDAC

Automation of the coordination and management of departures to meet enroute slots

APRIL 2013　　　　　**TODAY**　　　　　**APRIL 2015**

TBFM Re-Architecture

Re-architected System

- Upgraded operating system (OS) from Solaris to Linux
- Reduced footprint
- Resolved end-of-life
- Increased processor speed and performance to allow for growth of new capabilities (GIM-S, Information Sharing, IDAC)

Schedule

- Deployed to 20 ARTCCs in 5 months
- Full NAS Deployment in less than a year
- Lab Deployment at FAA Academy
- Augmented training with post site support during waterfall
- Utilized Discovery Sites as transferred Best Practice
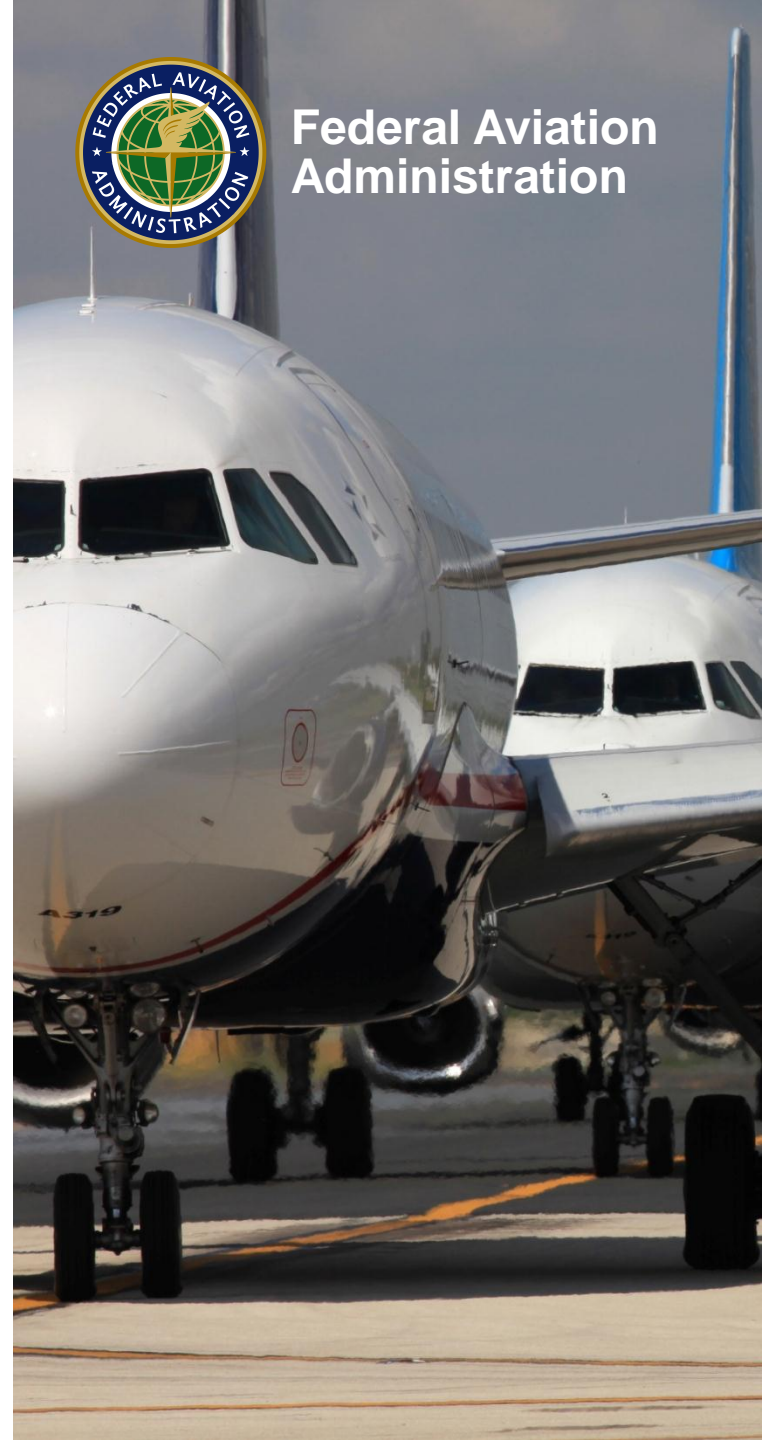- Successful collaboration of FAA PMO, Tech Ops, Air Traffic, Lockheed Martin, Support Contractors …. TEAM!

TBFM
Information Sharing

Information Sharing

- **Supports RTCA Task Force 5 Operational Capability 46 and 47 (Improved CATM and Integrated System Wide Approach)**

- **Information Sharing Benefits**
  - Non-NAS Consumers/Airlines
    - Use TBFM information Sharing to better predict arrival/departure times of aircraft
      - » Insight into scheduled wheels-up times (scheduled departure time) once TBFM schedules a departure
      - » Enhance situational awareness to improve airport/gate utilization
  - NAS Consumers
    - Improve coordination between multiple FAA Systems to maximize efficiency
    - Reduce double delays by improved situational awareness of TBFM data
    - Conduct analysis of TBFM TMIs

Information Sharing Overview

- **TBFM is Planning for NAS and Non-NAS Consumers of the Information Sharing Service**

  - NAS consumers: TFMS, TFMD
    - NAS consumers will be able to receive all information produced by Information Sharing

  - Non-NAS consumers: Delta to start, followed by other airlines, Lincoln Labs, Volpe, etc.
    - Non-NAS consumers will be able to subscribe to all information produced by Information Sharing with sensitive and military flights information obfuscated

Information Sharing Overview

- **TBFM plans only to publish Information that is developed or derived by TBFM**
  - TBFM to publish the following categories of information:
    - Aircraft Information
      - Includes flight plan information, MRE information, ETAs, STAs, etc.
    - Configuration Information
      - Arrival Airport Configuration, Acceptance Rates, etc.
    - Metering Status Information
   - TMA Metering Status Group, Interface Status Group, etc.

Information Sharing Overview

- **XML Style-sheets are applied on the TBFM back-end**
- **TBFM will add flags into the Java Message Service (JMS) Properties field, which NAS Enterprise Messaging Service (NEMS) will use to make routing decisions**
- **All message types that do not have to be customized for each Consumer would be flagged based on data attributes**
  - Ex: Arrival Airport Configuration, Airport Acceptance Rate

- **A Consumer would be able to specify in granularity (down to child level attribute) as to what data they want to consume**

TBFM Information Sharing Architecture
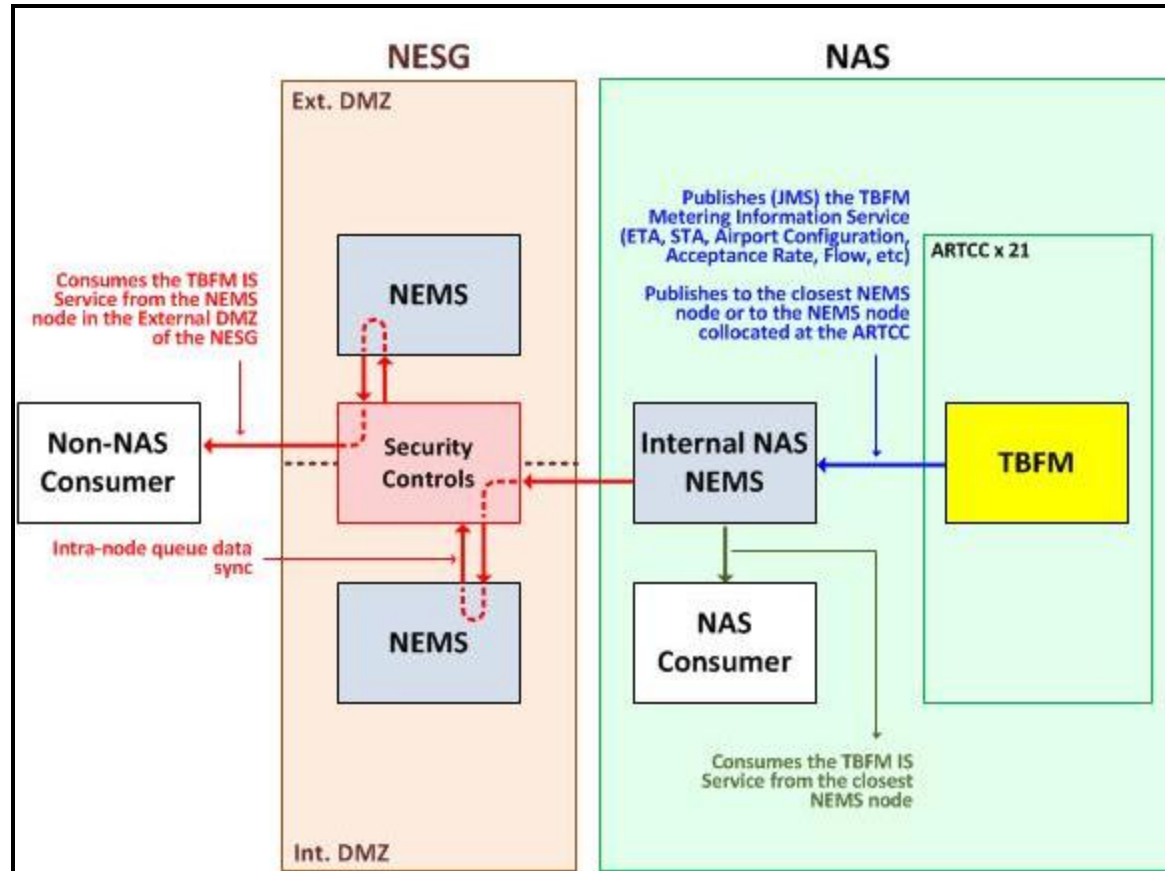
IS Service Taxonomy
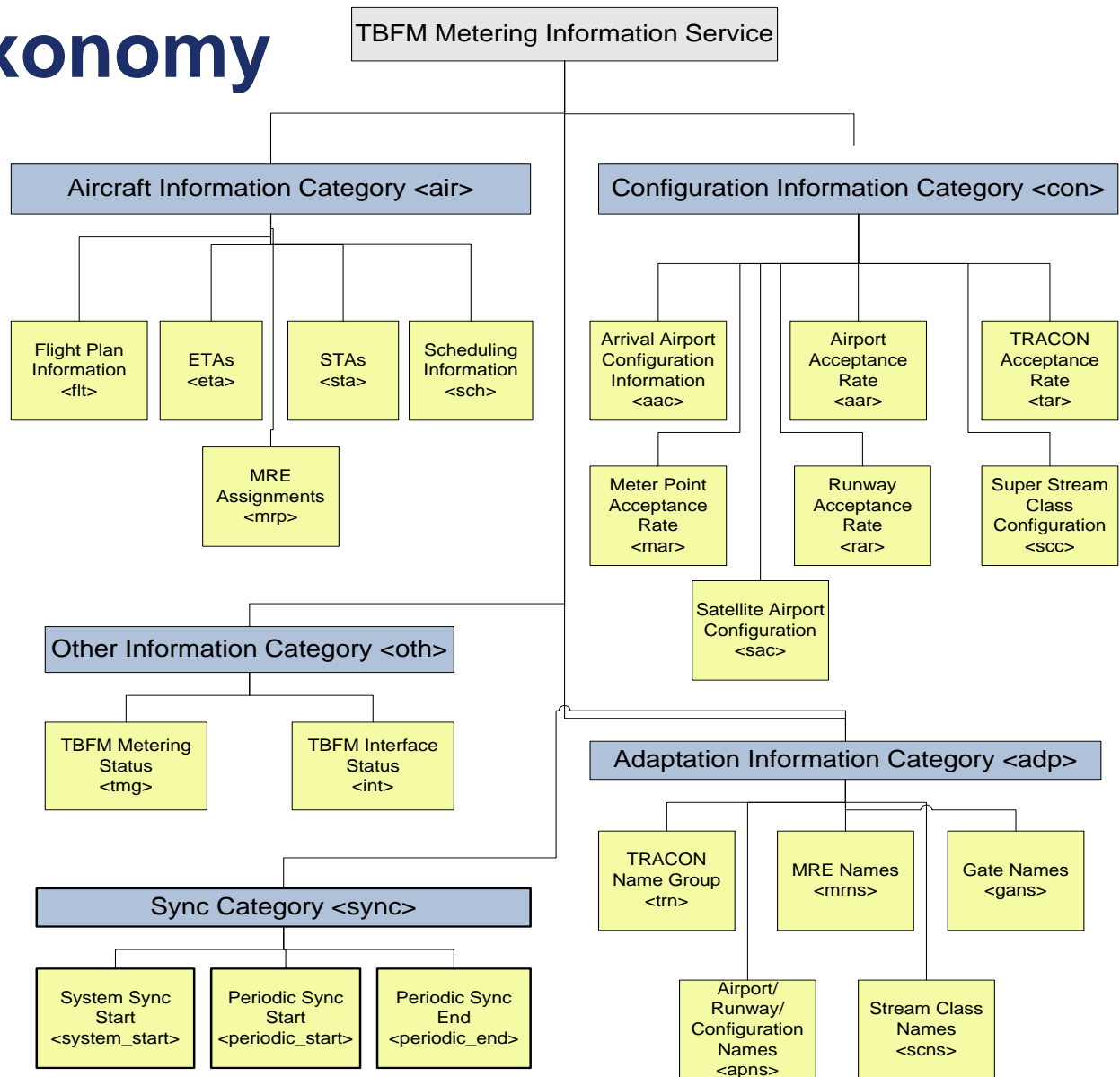
Schedules and Subscribing

- **April 2014**
  - ZTL to start publishing data to SWIM

- **Fall 2014**
  - All 20 centers publishing data

- **Subscription to this data is handled by SWIM and its "on-boarding" process**
  - Swim is presenting and will dive down deeper into this process

For additional information or to request a copy of the JMSDD please contact chris.pressler@faa.gov

TBFM
Extended Metering and Speed Advisory

Federal Aviation Administration

Overview

- Ground Interval Management – Spacing (GIM-S) comprises a set of ground functions to support operations to:

  - Increase opportunities for <u>Optimized Profile Descents</u> (OPDs) by pre-conditioning the spacing and sequencing of the arrival stream
  - Minimize the use of vectoring for problem resolutions
  - Improve trajectory modeler performance with ADS-B data
  - Provide speed advisories to assist in the delivery of aircraft to a Meter Point/Meter Fix

- Functionality allocated across multiple platforms, creating this NextGen capability

Architecture

Speed Clearances

Speed Clearances Acceptance/Rejection

TBFM

- Scheduling and Sequencing
- Trajectory Modeling
- Problem Prediction and Resolution

HADDS/EDDS

Meter Lists and Constraints

Speed Advisories

ADS-B Surveillance

Speed Advisory Acceptance

ERAM

Speed Advisories

ATC Response

Display Processing
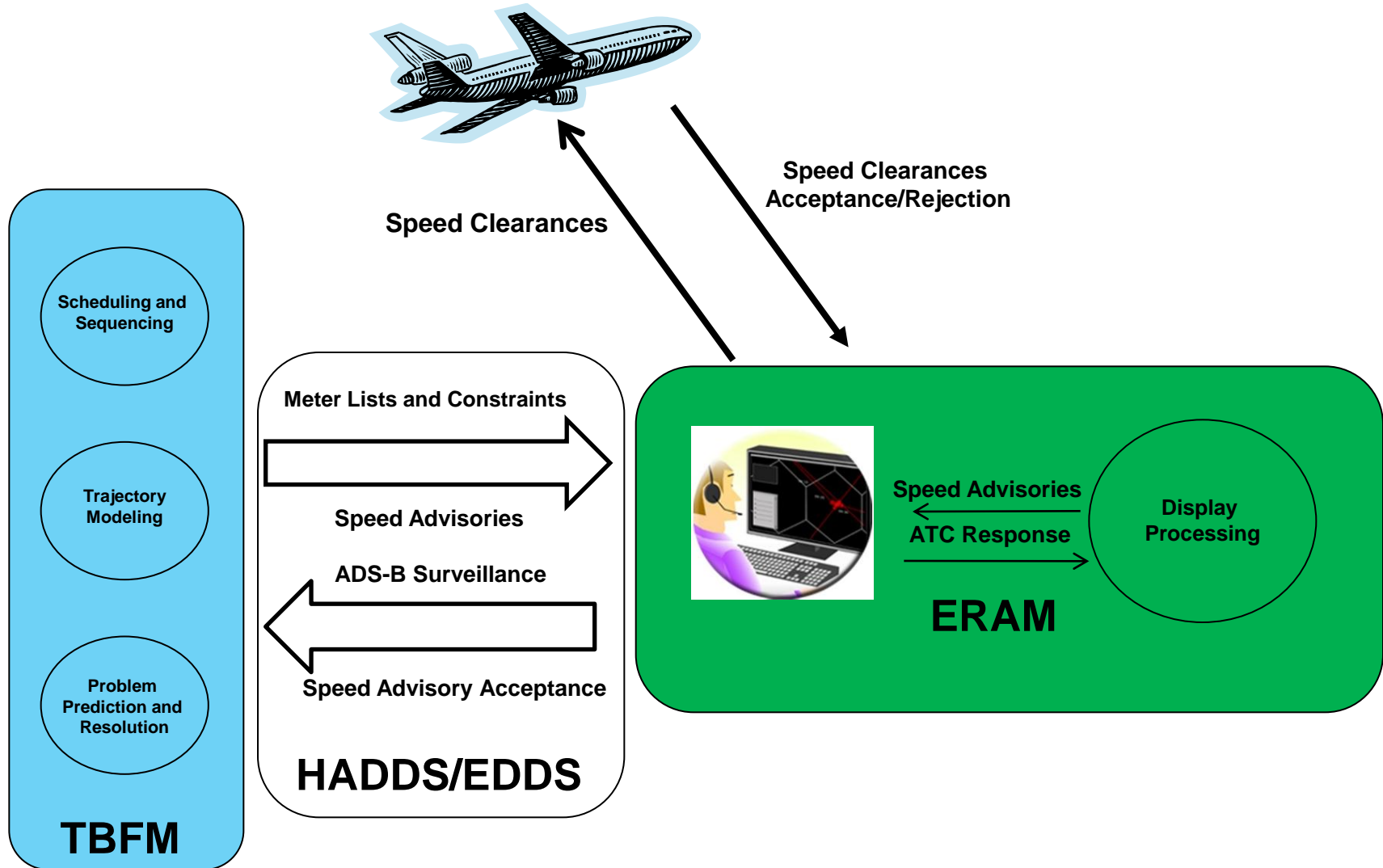
Extended Metering

- **Extended Metering creates additional Meter Points over extended distances for the arrival stream**
  - Meter Points can be coupled to other Meter Points
  - Segments a long freeze horizon to multiple shorter freeze horizons
    - Freeze horizons ~ 200 NMI
  - Allocate delay further upstream prior to Top of Descent

- **Stabilize ETA accuracy with shorter freeze horizons**

Extended Metering

- **Meter points located at downstream side (exit point) of each Center**
  - Each meter point generates a Schedule Time of Arrival (STA) for flights
  - Controllers work off delays to meet STA at their meter point
  - Advisory tools assist controllers in meeting STAs to each meter point in the flow

Example shows metering over an extended distance to EWR
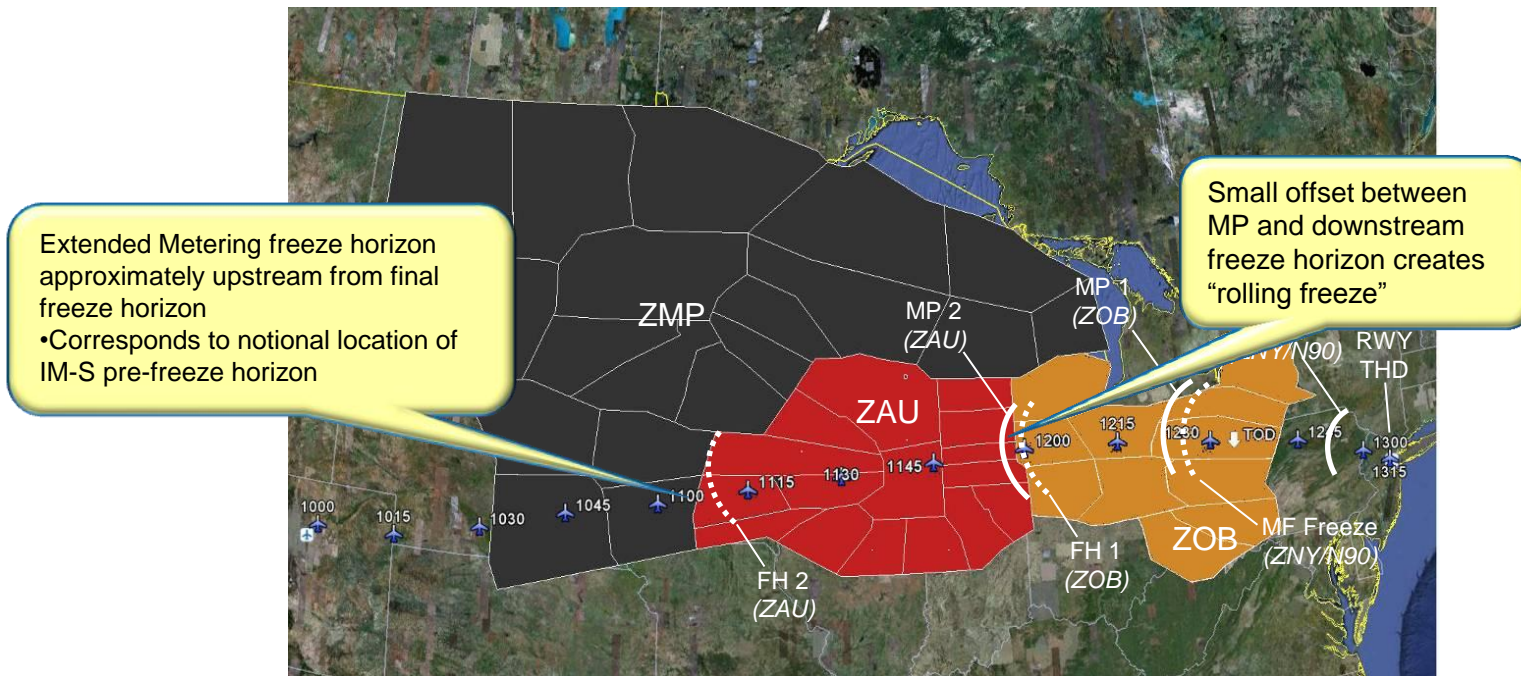
Speed Advisories

- **Speed <u>advisories</u> will provide a solution to ATC to meet frozen STAs at a <u>Meter Point</u> or <u>Meter Fix</u>**
  - Solutions are "Global"
  - Aid in the Delivery Accuracy to a Meter Point or Meter Fix

- **Speeds are provided in Mach or Calibrated Air Speed (CAS) for cruise and CAS only for descent**
  - Advisories are not provided while aircraft are in ascent or descent

- **If speed advisories cannot resolve delays, an indication will be provided to the controllers**

TBFM
Intergraded Departure and Arrival Control (IDAC)

Federal Aviation Administration

Departure Scheduling Today

- When conditions dictate, ARTCC/TRACON will call with either MIT restrictions or notification of Call For Release (APREQ)

- Restrictions are managed either manually by ATCT/TRACON/ARTCC via traditional Mile-in-Trail (MIT) / Minutes-in-Trail (MINT) or by ARTCC using the EDC functionality of TBFM

APREQ Communication Today

Tower

A/C Ready Time →

← Departure Time

TRACON

Tower

A/C Ready Time →
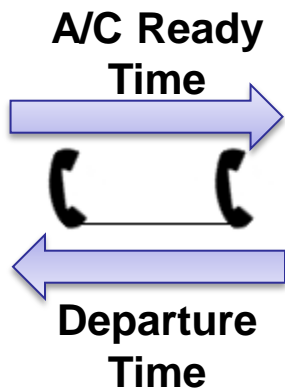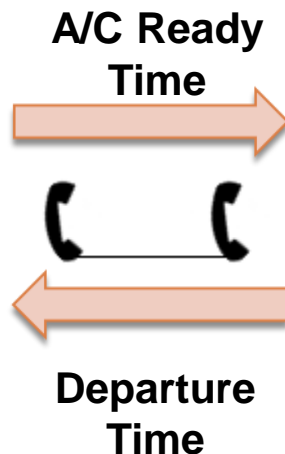
← Departure Time

ARTCC
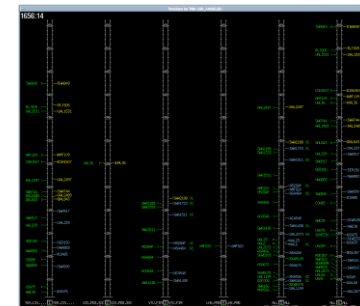
Integrated Departure Arrival Capability (IDAC) in TBFM

IDAC automates the process of monitoring departure demand and identifying departure slots. IDAC coordinates the departure times between airports and provides situational awareness to Air Traffic Control Towers (ATCT) so that they can select from available departure times and plan their operation to meet these times. The results of these enhancements are more efficient departure flows and less delay
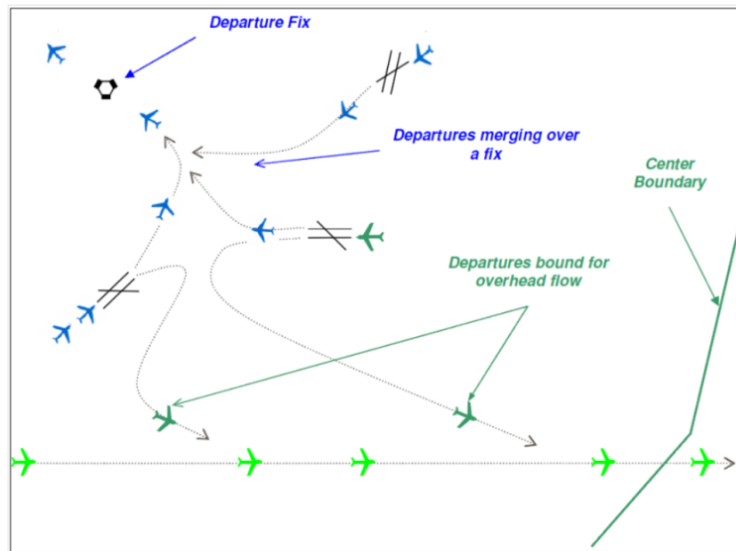
Changes ATCT role from monitoring TBFM to active participation

IDAC in TBFM

- **Enhancement introduces a new Tower focused user interface called the Integrated Departure Scheduling Tool (IDST) which will provide Tower personnel:**

  o Electronically schedule APREQ/CFR instead of via the phone – includes audible notification

  o A panel depicting Unscheduled Flights (flights that will need to be scheduled with the IDST).

  o Scheduling mode for each flight (Automatic, Semi-Automatic, Manual)

  o A dynamic list of current restrictions

  o A view of current and future congestion over various Constraint Satisfaction Points (CSP)

Enables reduction in phone calls from Tower to ARTCC/TRACON

Different Scheduling Modes

- **Manual (Call For Release) –** Same process as today via the phone with Aircraft IDs color coded in gray

- **Semi Automatic –** Scheduled by the Tower via the IDST pending approval from the ARTCC/TRACON (approving authority will have the ability to either accept request as is, reschedule to a different time or cancel request entirely) with Aircraft IDs color coded in blue

- **Automatic –** Tower schedules directly via the IDST without waiting for approval from the ARTCC/TRACON with Aircraft IDs color coded in white

Approving ARTCC/TRACON controls the mode for the Tower

Overview of Tower IDST

Alert and Notification Center

Flight Search capability

Unscheduled Flights List

Scheduled Flights Table

Flight Information Pane
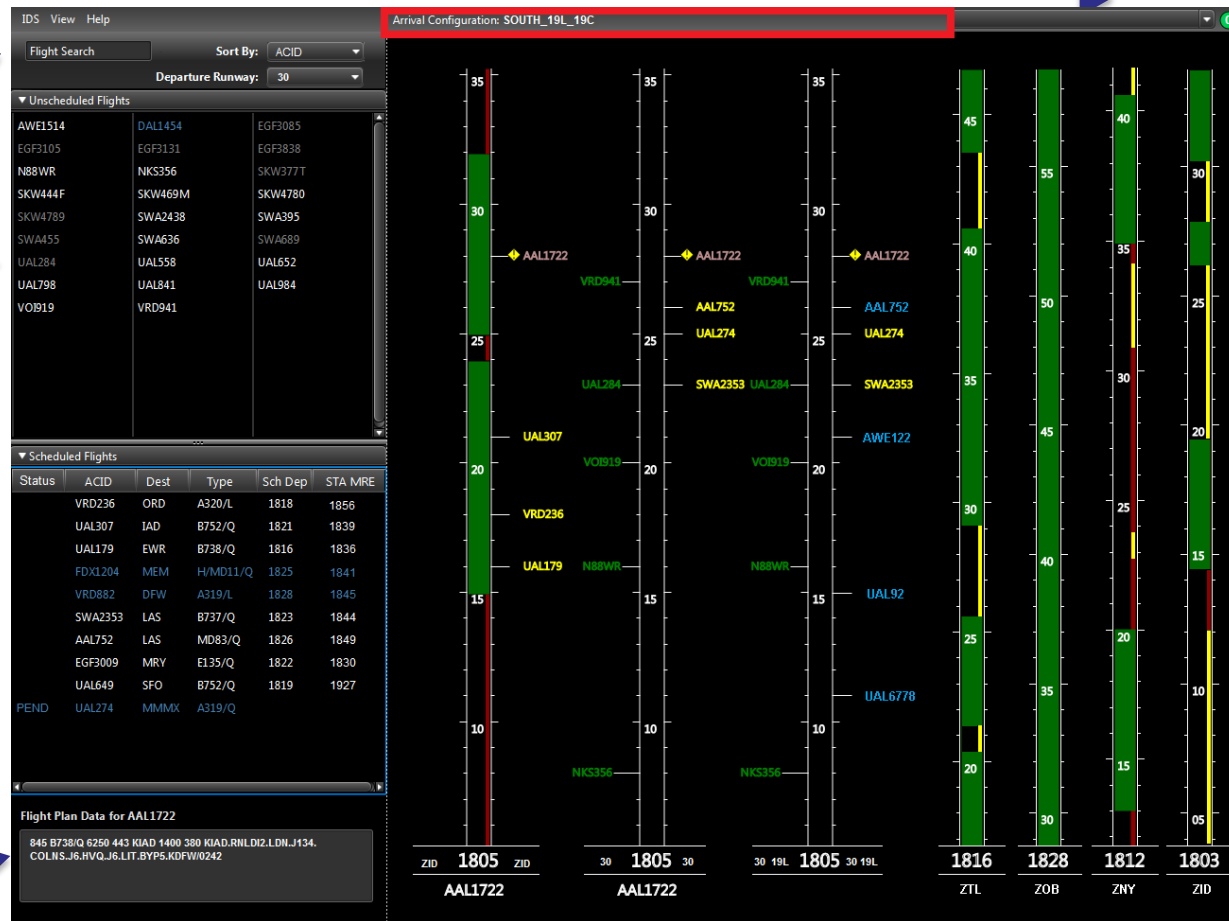
Flight Specific Timeline

Runway Timelines

Constraint Awareness Timelines

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IDAC Deployment Locations

ZLA	LAX
	LAS
	SAN
	SNA 🟠
SCT	BUR 🟠

ZOB	DTW
	CLE
	PIT 🔵
	BUF 🔵
	ROC 🔵

ZBW	BOS
	BDL 🔵
	PVD 🔵
	ALB 🔵
	MHT 🟠

ZID	CVG
	IND 🔵
	SDF 🔵
	CMH 🔵
	DAY 🔵

ZDC	IAD
	DCA
	BWI
	RDU 🔵
PCT	RIC 🟠

🔵 New ATCT and Co-Located TRACON

🟠 New ATCT

Anticipated Benefits of IDAC Enhancement

- Streamlined departure scheduling in Automatic and Semi-Automatic scheduling modes via the IDST

- Improved situational awareness of current and future congestion over Constraint Satisfaction Points via the color coded timelines

- Automated notification of new constraints and Apreq status via the Alert and Notification Center and Unscheduled Flights panel

- More accurate and efficient flow of traffic especially when multiple towers depart over common departure fixes

- Approving authority will have the ability to revise or cancel scheduled departure times with two way audible and visual notification between facilities

- Users will have the ability to swap scheduled departure times on flights depending upon CSP availability and approval mode

TBFM
National Training
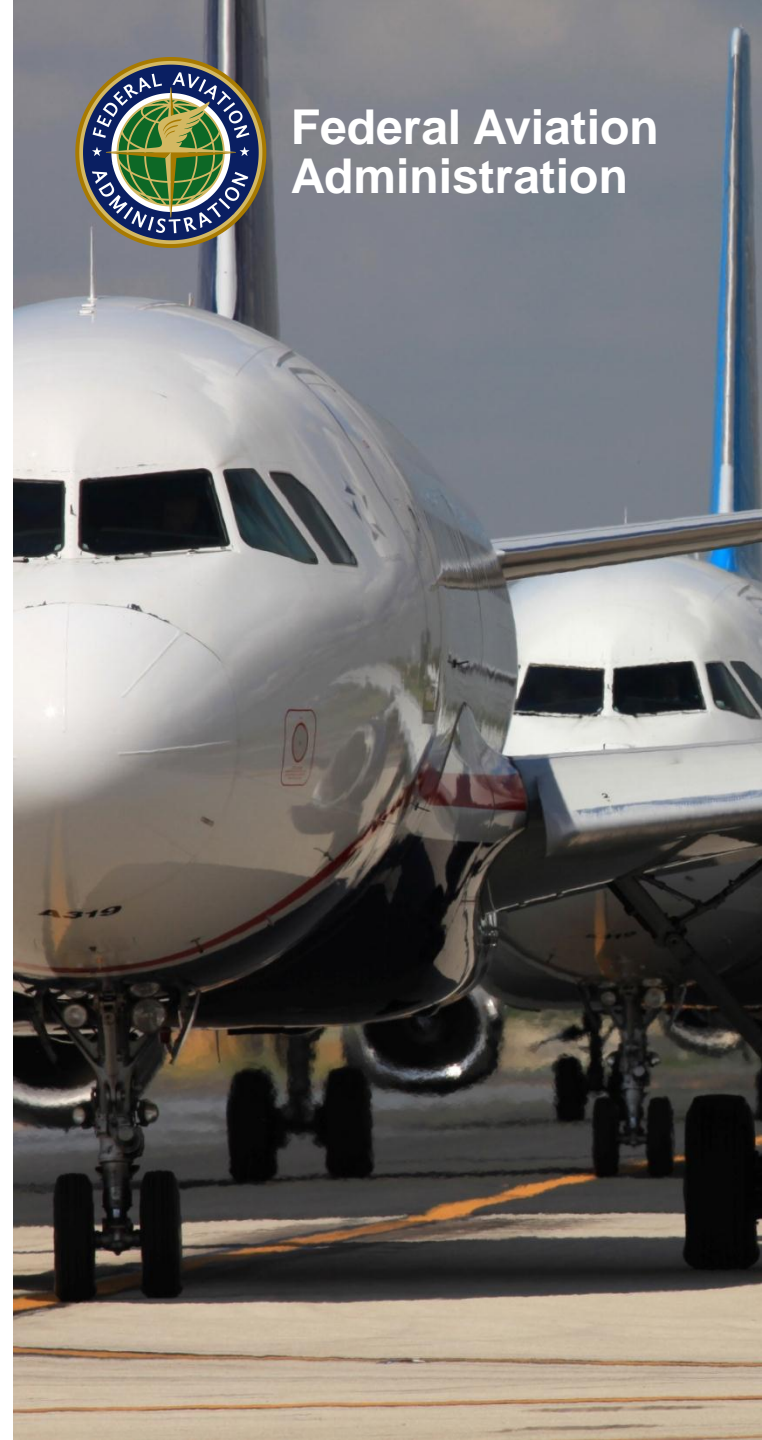
TBFM Air Traffic Training

Background:

- TMA/TBFM training relegated to the facility level.

- Each facility designed its own instructional process, typically consisting of locally developed courses.

- Training lacked integration with other TMA/TBFM-capable facilities.

- Non-standard training resulted in diverse and varied levels of TMA tool proficiency, and inconsistent application of TMA technologies.

- Recognized in Mission Shortfall Analysis

- RTCA Task Force 5 Recommendation

Training

National Training Goals:

- Promote a greater understanding of TBFM

- Provide a baseline for consistent use of TBFM

- Improve the collaboration and working relationship between the TMCs and the Air Traffic Controller Specialists (ATCSs)

Status:

- Web-based training for ATCS in progress

- Development of instructor-led Cadre training for TMC in progress

- Team on course for Sept 2014 Training Development completion

TBFM
Beyond Work Package 2

Federal Aviation
Administration

What is TBFM Work Package 3 (WP3) ?

- **TBFM WP3 is currently in Investment Analysis and planned to occur during the 2015-2019 timeframe**

- **TBFM WP3 will enable:**
  - Maximized traffic flow and airport usage
  - Metering into the terminal domain
  - More flexibility to accommodate reroute operations during adverse weather conditions

- **Continues FAA trend to capability level acquisitions (ERAM-TBFM-STARS/TAMR).**

QUESTIONS ?

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